BATOKA GORGE HYDRO-POWER PROJECT
PROFILE

INTRODUCTION

The proposed Batoka Gorge Hydro-Power Project is located on the Zambezi River approximately 54km downstream of the world famous Victoria Falls and upstream of the existing 1,470MW Kariba Dam hydroelectric scheme. The project site is located across the boundary between Zambia and Zimbabwe. The proposed scheme includes a 181m high Roller Compacted Concrete gravity arch dam, radial gated crest type spillway, two underground power stations on each side of the river with four 200 MW Francis turbines installed in each, giving a total capacity of 1,600 MW for the scheme. The scheme is designed as a run-of-the river scheme with an estimated average energy generation of 8,700 GWh/year to be shared equally between Zambia and Zimbabwe. The reservoir is fully located within the Batoka Gorge and has a relatively small surface area of 26km^2

This project would involve the construction of two underground power caverns (one North and one South), each with an installed capacity of 800MW for a combined 1,650MW. Generation efficiency would be at 86%. Other Infrastructure such as transmission lines, access roads, housing and social amenities would also be constructed. This entails the establishment of a Project Management Unit be in order to facilitate the coordination.

The detailed feasibility study that was prepared by Lahmeyer International, Knight Piesold Consulting Engineers and EWI Engineers & Consultants and was completed in 1993, indicated that it is economically and technically feasible to construct 4 x 200 MW units on the Zimbabwe side and 4 on the Zambian side. However, the feasibility study will require review and updating. Similarly, comprehensive EIA and SIA were carried out in 1993 and 1998. These too will require updating.

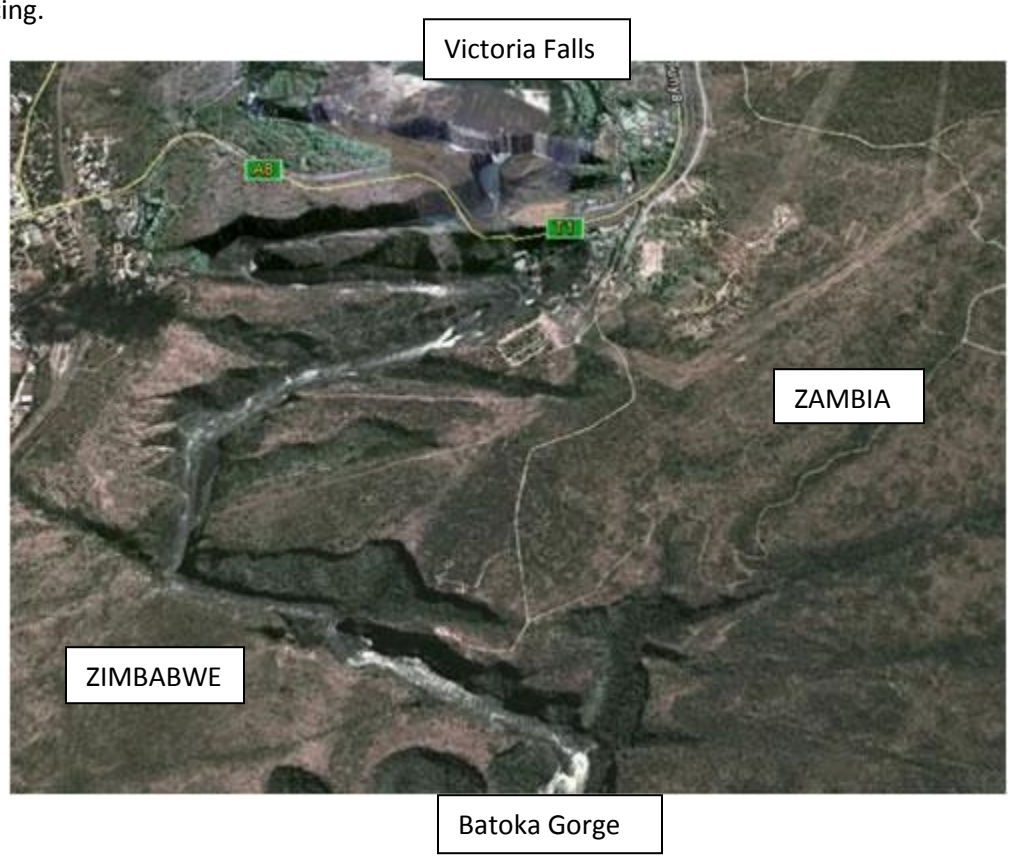
OBJECTIVES

The objective of the project is to increase power generation capacity between Zambia and Zimbabwe, reduce power outages and reduce reliance on coal fired power stations. Once completed the Batoka Hydro scheme will leave Zambia and Zimbabwe as net exporters of power in the region after meeting local needs. The project will also improve the generation mix in Zimbabwe which is currently skewed in favour of fossil-fuel (coal) fired plants which are expensive and associated with greenhouse gases.

MARKETS

Zimbabwe is facing an energy demand and supply gap which is rapidly increasing due to increased consumption in all sectors of the economy, in particular, mining and industrial sectors. It is, therefore, vital that a reliable and uninterrupted supply of energy be secured. Zimbabwe's energy industry is among the fastest growing energy industries in Africa.

In recent years, Zimbabwe's electricity generation sector has been liberalized and new players are allowed to establish independent power stations to bridge the huge power gap that the country is experiencing.



On the other hand, despite Zambia having 40.7% of the water resource in the Zambezi River Basin and a hydropower resource potential estimated at 6,000MW, her installed capacity is around 1,900MW. Zambia's electricity is predominately consumed by the mines. As Zambia progresses towards doubling its copper production by 2018 through opening of new mines and expansion of existing mines, power shortages are becoming a common feature.

The above experiences are similar also in South Africa, Botswana and Namibia. Therefore, the power deficits that eastern and southern Africa region has been experiencing in the last few years should be seen as an opportunity for investing in power generation projects. SADC is supporting the accelerated development of power generation and interconnection projects for the benefit of the countries of eastern and southern Africa.

ECONOMIC AND SOCIAL

The implementation of the project will improve power availability in both Zambia and Zimbabwe and reduce load shedding. This will spur additional investment and result in increased industrial development and performance. Increased power supply will also create opportunities for improved water and sanitation service delivery as most urban wastewater systems are energy dependent. This

will give rise to better social wellbeing as well as a better investment climate. The project will also stimulate other downstream economic activities. Power exports to the region will boost inflows of foreign currency.

Other spin-offs from the project include rural electrification, the development of residential areas, infrastructure and social amenities on both the South and North Banks of the Zambezi River. Increased power supply will also benefit activities related to tourism, irrigation and fisheries.

TECHNICAL DETAILS

Dam will be a Roller Compacted Concrete Gravity Arch type with a height of 181m and using a volume of 4.08 x 10^6 m^3 of concrete. The crest thickness will be 12m while the base thickness will be 97.8m. The crest length would be 766.5m. The spillway would be of the Crest Overflow type with 12 radial gates, 14m wide and 13m high. The design capacity of the spillway is a flow rate of 20,000m^3/s, which is the regional maximum flood. The volume of the Batoka reservoir at normal full supply level will be 1,680 x 10^6 m^3, with a low level outlet of reasonable dimensions and a total discharge capacity of 1,600m^3/s, operated during the low flow season. The flow regime prevailing in the Zambezi River, the installed capacity of the powerhouse and the fact that the reservoir has limited retention capacity, means that the spillway facility will, in average years, be in continuous operation for several months. The dam will have a catchment area of 508 000km^2 from the upper Zambezi.

The two Power Stations will be housed underground (one North and one South Bank) with installed capacity of 1,600MW (2x800 MW).

PROJECT COST

Total project is estimated cost at over US$ 4 billion. The project estimated costs as at 2009 were USD 2.8 billion.

It is estimated that project construction would be completed 10 to 13 years after financial close.

FUNDING

No funding for project development is available. However, various funding options have been considered, including loans, Build-Own/Operate-and-Transfer (BOT), and Public Private Partnerships (PPP). Repayment of financing would come from the sales of electricity.

FINANCIAL ANALYSIS

In the 1993 feasibility study, the unit cost of Batoka was found to be lower than for any other potential hydro-power schemes on the middle Zambezi, upper Zambezi, Luapula, upper Kafue and other rivers in Zambia, with the exception of a 450MW development in the Kafue Lower Gorge. In conjunction with other alternatives involving interconnections with DRC, increase in capacity at Kariba and Victoria Falls, and additional coal powered plants at Hwange and Sengwa, it was determined that Batoka could be part

of the least cost power generation development plan of the combined Zambian and Zimbabwean power system. Batoka was also found to be the best hydro-power option which has been investigated on the Zambezi River. Additionally, the study showed that the best installed capacity for Batoka was around 1,600MW.

Based on Tumbare (2011) the financial internal rate of return of the project is around 17%.

ENVIRONMENTAL ISSUES

The first environmental impact assessment was carried out in 1993 was based on World Bank Guidelines. The study recommended further environmental studies which were then carried out in 1998. Like most dam projects, the development of Batoka will result in inundation of land and possible reduction in natural habitat as well as displacement of people. The low population density in the area will minimize the need to resettle people. A proper resettlement action plan and environmental management plan will be required to mitigate the negative social and environmental impacts of the project. However, there no potential impacts of significant magnitude to warrant the abandonment of the project.

One major positive impact of the project compared to other alternative strategies of expanding power generation in Zimbabwe is that the project does not depend on renewable sources of fuel (e.g. coal) whose extraction is associated with serious environmental degradation. Furthermore, the coal fired power stations are associated with production of large amounts of greenhouse gases.

PROJECT RISKS

Risks associated with the project may hinge on the stability of the currency use to fund the project. If US Dollars are used the currency risk is expected to be minimal. Another risk that could arise is failure to recover cost due to the then prevailing tariff levels. This risk is mitigated by the Governments of Zimbabwe and Zambia adopting cost reflective tariffs and the tariffs are expected to increase. The Zambezi is a trans-boundary river and as such there is need to seek consent from other riparian states. However, it is expected that there will be few impediments to obtaining approval from riparian states to construct the dam and scheme on the Zambezi River given that the scheme will be of benefit not only to Zambia and Zimbabwe but also to the other SADC/SAPP member states.

LEGAL AND REGULATORY

The project falls under the supervision of the Zambezi River Authority, an entity jointly owned by the Governments of Zambia and Zimbabwe and it is responsible for the operation and maintenance of the Kariba Dam Complex, as well as the investigation and development of new dam sites on the Zambezi River.

In 2012, Zambia and Zimbabwe took the critical first step by signing a Memorandum of Understanding (MOU) on cooperation to jointly construct the Batoka Gorge hydro-power station.

With ZESA and ZESCO Power Station extensions at Kariba, the Batoka Project becomes more critical for the conjunctive operation of the two dams as this will increase firm capacity at Kariba.

The risk is the project may not be able to attract sufficient concessionary financing to enable it to be implemented.

STATUS AND NEXT STEPS

Exploratory drilling and foundation work for the dam was completed in 1991. This was funded by the Zimbabwean government. Technical, legal and environmental feasibility studies were carried out in 1993. Another EIA was conducted and completed in 1998. The Project Development Plan was updated in 1998. However, the final designs have not yet been completed. The feasibility study will be reviewed and updated during 2013 and this will inform decisions on the future development of the project.

In February 2013, the Zambezi River Authority invited Expressions of Interest (EoIs) from interested companies and/or consortia with experience in developing large scale hydropower projects on Build-Operate-Transfer (BOT) basis.